

FIELD MODIFICATION FORM
LOWER PASSAIC RIVER RESTORATION PROJECT

Date: June 5, 2008

Documents: QAPP/FSP Addendum, December 2007 and Final QAPP, August 2005

Activity: Sampling and Analyses of Surface Sediment Samples
From the Lower Passaic River (River Mile 0.0 to 1.0)

Requested Modifications: At the request of the United States Environmental Protection Agency (USEPA) Region 2 and the United States Army Corps of Engineers-Kansas City District (USACE-KC), Malcolm Pirnie, Inc. personnel will collect and analyze additional surface sediment samples from between river mile (RM) 0 and RM1 of the study area to determine the surface sediment contaminant concentrations at the mouth of the Passaic River. The data are needed to fill data gaps for the Lower Passaic River Early Action evaluation. The surface sediment samples will be collected from both the navigation channel and from submerged areas of the Kearny Point mudflat. Inter-tidal areas will not be sampled. This field modification is intended to replace the modification dated May 6, 2007.

The following elements of the current surface sediment sampling effort will be conducted using the same procedures for surface sediment sampling as previously approved in the December 2007 Quality Assurance Project Plan (QAPP)/Field Sampling Plan (FSP) Addendum for the Lower Passaic River Restoration Project Empirical Mass Balance Evaluation:

- Sample collection techniques.
- Analytical methods, Quality Assurance (QA) criteria, and laboratory selection.
- Data validation.

Rationale and Sampling Design: The additional chemical data from surface samples collected from RM0 to RM1 are needed to fill data gaps, since there is currently little data available on the levels of chemical contamination in this portion of the study area. The data will be used to support the geochemical evaluation and risk assessment of the Lower Passaic River Early Action evaluation.

Sampling Task:

Surface sediment samples will be collected at eighteen locations. The sample collection procedures, the procedures for determining which samples will be analyzed for which parameters, and the sample locations are detailed below.

Sampling Locations and Depths

Prior to collecting a sample at each of the target surface sediment sampling locations, described below, sediment probing will be performed adjacent to each proposed location

(Refer to December 2007 QAPP/FSP Addendum, Attachment 11 - SOP No. 8 on Sediment Probing). If the probing reveals insufficient mudflat sediment depth to allow for the collection of a representative sample in the vicinity of the targeted sampling location, then a decision as to where to relocate the affected samples will be made through discussions between the field geologist and the project geochemist.

Navigation Channel Sampling

Nine locations will be sampled along three transects crossing the navigation channel of the Lower Passaic River between RM0 and RM1. Samples will be collected from the 0-1 and the 0-6 inch depths. These transects are located at approximately RM0, RM0.2, and RM0.6. Based on the configuration of the channel within the Kearny Point Reach, three sample locations are designated on each transect: two within the navigation channel and one within the eastern shoal area as it transitions (*i.e.*, where shallowing of the water occurs) into the Kearny Point Mudflat. Samples will not be collected from intertidal locations. The westernmost sampling location, along the RM0 transect, has been positioned outside of the navigational channel so as to be located within an historical depositional zone (See Figure 1).

Kearny Point Mudflat Sampling

Nine locations will be sampled, each below the present day mean low water elevation. Samples will be collected from the 0-1 and the 0-6 inch depths. The nine locations have been established on a grid so that potential contaminant concentration gradients on the mudflat can be evaluated in various orientations (*i.e.*, north/south and east/west).

See Figure 1 for the planned sampling locations. The actual sampling locations associated with the channel and the mudflat may have to be adjusted due to field conditions encountered, as determined by the field geologist and/or project geochemist.

Sample Collection

The Navigation Channel and Kearny Point Mudflat surface sediment samples will be collected using an Ekman Dredge following SOP 24 found in Attachment 15 of the December 2007, QAPP/FSP Addendum. At each of the eighteen sampling locations, samples will be collected from the 0-1 and the 0-6 inch depths. Multiple co-located Ekman grabs will be collected, if necessary, until sufficient sample volume is obtained. The samples will be analyzed as described in the section below on Analyses and in Worksheet 18. Prior to collecting each grab sample, the Ekman dredge will be decontaminated with Liquinox and water and rinsed with clean water. A similarly decontaminated Lexan (*i.e.*, polycarbonate) dredge liner will be secured in place using the two quick-release pins. The spring-loaded jaws on the Ekman will be hooked in the open position on the trigger mechanism. Sufficient rods will be screwed to the dredge extension to reach the river bottom.

Upon contact with the river bottom, the dredge will be advanced approximately 6

inches into the sediment, to prevent overfilling of the dredge. The dredge trigger will be activated and the sample will then be slowly brought, vertically, to the surface of the river. If overfilling occurs, the dredge will be emptied and rinsed, and sample collection retried.

Once a proper sample has been retrieved, the Ekman will be carefully, and slowly, drained of excess water, positioned in a receiving pan (that has been lined with clean aluminum foil) and, with the assistance of another person, the dredge will be opened and pushed rapidly against the bottom of the receiving pan to prevent loss of the sample. The polycarbonate liner will be released so that the liner and sample remain in the pan while the dredge is carefully removed.

Samples will be collected for the analyses described in the Sample Analyses section below. Note that not all parameters will be sampled for at each sample location. The radiochemistry samples will be collected from the top 0 to 1 inches and placed in sample jars following homogenization. If multiple grabs are required to obtain sufficient sample volume, the same spatula/spoon will be used to obtain the sample from within the dredge liner. For the channel samples where full chemistry analysis is potentially being performed on the 0-1 inch sample, similar multiple grabs will be collected until sufficient volume has been obtained for all analyses. After mixing the sample is then placed into the appropriate sample jars. The co-located sample for the 0-6 inch depth is similarly obtained, however, after draining; the entire contents of the dredge are to be released into a stainless steel mixing bowl. The sample will then be homogenized and placed in the appropriate sample jars.

The retrieved sediments will have been obtained from the surface of the river bottom. Therefore, excess sediments obtained during this investigation will be returned to the river bottom in the general location where they were collected unless distinct oil sheen or petroleum odor, or other indication of petroleum contamination is observed. In this case, the material will be containerized for offsite disposal.

Sample Analyses

Navigation Channel Samples:

- Co-located grab samples will be collected from nine locations in the navigation channel from 0-1 and 0-6 inches in depth.
- 0 to 1 Inch Depth
 - Samples will be collected from all nine locations for radiochemistry dating and will be analyzed for beryllium-7 (Be-7), cesium-137 (Cs-137) and potassium-40 (K-40).
 - Samples will be collected from all nine locations for total organic carbon (TOC), target analyte list (TAL) metals, including titanium and mercury, and grain size analyses.
 - Samples will be collected and archived (frozen) by the laboratory for possible organic analyses. Based on the Be-7 dating, two of the nine archived (frozen) 0 to 1 inch samples will be selected and analyzed. The initial selection of

samples for analysis will be based on whether or not the samples are Be-7 bearing. Ideally, for Be-7 bearing samples and depending on the concentration of Be-7 present, analysis will be performed on the two samples providing the greatest longitudinal separation in the channel while having among the highest Be-7 levels. If only two samples are Be-7 bearing then these two will be analyzed. If no samples are found to be Be-7 bearing, than no further analysis will be performed. Organic analyses include Polychlorinated Dibenzodioxins (PCDD)/Polychlorinated Furans (PCDF), Polychlorinated Biphenyl (PCB) congeners, Polycyclic Aromatic Hydrocarbons (PAHs), and organic chlorinated pesticides.

- 0 to 6 Inch Depth - A co-located grab series will also be collected to obtain 0 to 6 inch surface sediment samples for chemical analyses.
 - Samples from all nine locations will be analyzed for TAL metals, including titanium and mercury, TOC and grain size.
 - At five pre-determined sample locations, five of the 0 to 6 inch samples will be submitted for organics analyses. See Figure 1 for the location of these five samples and Attachment 1, Worksheet 18.

Kearny Point Mudflat Samples:

- Co-located grab samples will be collected at nine locations within the Kearny Point mudflats.
- The first grab sample will be used to obtain the 0 to 1 inch surface sediment samples for radiochemistry dating only. All nine of these samples will be sent for radiological analyses.
- Co-located grab samples will be collected to obtain 0 to 6 inch surface sediments for the remaining analyses. All of the 0 to 6 inch sediment samples will be submitted for TAL metals, including titanium and mercury, TOC and grain size. Five of these samples, distributed throughout the limits of the sampling grid, will also be analyzed for the organic parameters.

The analytical Standard Operating Procedure (SOP) requirements are detailed in Attachment 1 (Worksheet 19). Sampling locations are shown on Figure 1. The analyses to be performed on the samples and sample subsets are shown on Attachment 1 (Worksheet 18).

Attachments and Figures:

Figure 1	Proposed Sampling Locations Map
Attachment 1	Revised QAPP Worksheets Worksheet 11: Project Quality Objectives Worksheet 18: Sampling Locations and Methods/SOP Table Worksheet 19: Analytical SOP Requirements Worksheet 20: Field Quality Control Table Worksheet 21: Project Sampling SOP Table

References:

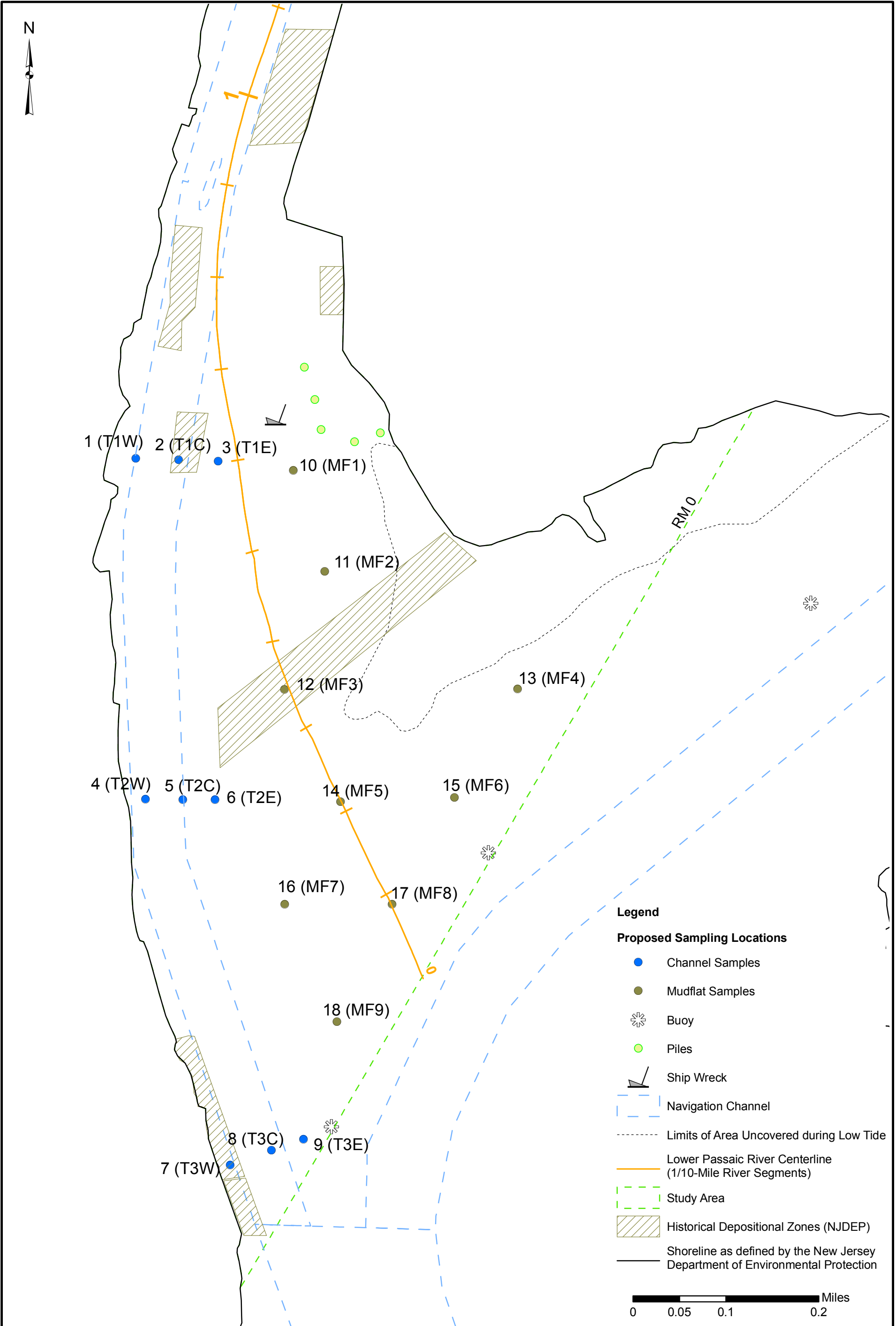
Lower Passaic River Restoration Project, Quality Assurance Project Plan, August 2005.

QAPP/FSP Addendum for Lower Passaic River Restoration Project Empirical Mass Balance Evaluation, December 2007.

Malcolm Pirnie Project Manager: _____

Malcolm Pirnie Deputy Project Manager: _____

Malcolm Pirnie Site QC Officer: _____



Proposed Sampling Locations RM 0- RM 1
Lower Passaic River Restoration Project

Figure 1

June 2008

ATTACHMENT 1

Revised UFP-QAPP Worksheets

QAPP Worksheet #11

(UFP-QAPP Manual Section 2.6.1)

Project Quality Objectives /Systematic Planning Process Statements

Who will use the data?
The data will be used by USEPA Region 2, USACE-KC, Malcolm Pirnie, Inc. and Battelle.
What will the data be used for?
Data will be used to fill data gaps in the characterization of Passaic River sediment contamination between RM0 and RM1. The data will be used to determine the surface sediment concentrations of chemicals of potential concern and to support the geochemical evaluation and risk assessment of the study area for the Early Action evaluation.

What type of data are needed? (target analytes, analytical groups, field screening, on-site analytical or off-site laboratory techniques, sampling techniques)

Surface sediment samples will be collected at eighteen locations by the Malcolm Pirnie field team using an Ekman Dredge. Samples will be analyzed for the same parameters and by the same methods employed for surface sediments as described in the December 2007 QAPP Addendum for the Lower Passaic River Empirical Mass Balance Evaluation. Samples will be collected from 0 to 1 and 0 to 6 inch depths at each location. Test parameters on selected sediment samples will include radiochemistry (Be-7, Cs-137 and K-40), TAL metals, including titanium and mercury, TOC and grain size. A predetermined subset of 0 to 6 inch sediment samples will be analyzed for organic parameters including PCDDs/PCDFs, PCB congeners, PAHs, and pesticides. In addition, two sediment samples representing recently deposited sediments, as identified based on Be-7 data, will be collected from the 0 to 1 inch depth in the navigation channel and analyzed for organics. These new data will allow for the connection of the data on recent surface sediments in the Passaic River above RM 1 with data obtained on surface sediments in Newark Bay.

How “good” do the data need to be in order to support the environmental decision?

The data should be comparable to the data previously collected to characterize the Passaic River sediments upstream of RM1; therefore, the samples will be analyzed using the same methods, laboratories and measurement performance and QA criteria as described in the December 2007 QAPP/FSP Addendum For the Lower Passaic River Empirical Mass Balance program.

How much data are needed? (number of samples for each analytical group, matrix, and concentration)

Co-located grab samples will be collected at eighteen locations from 0 to 1 and 0 to 6 inches in depth; nine in the Passaic River navigation channel and nine at the Kearny Point Mudflat. These locations are shown on Figure 1.

Navigation Channel Samples:

- 0 to 1 Inch Depth
 - Samples will be collected from all nine locations for radiochemistry dating and will be analyzed for beryllium-7 (Be-7), cesium-137 (Cs-137) and potassium-40 (K-40).
 - Samples will be collected from all nine locations for total organic carbon (TOC), target analyte list (TAL) metals, including titanium and mercury, and grain size analyses.
 - Samples will be collected and archived (frozen) by the laboratory for possible organic analyses. Based on the Be-7 dating, two of the nine archived (frozen) 0 to 1 inch samples will be selected and analyzed for organic analyses including Polychlorinated Dibenzodioxins (PCDD)/Polychlorinated Furans (PCDF), Polychlorinated Biphenyl (PCB) congeners, Polycyclic Aromatic Hydrocarbons (PAHs), and organic chlorinated pesticides.
- 0 to 6 Inch Depth - A co-located grab series will be collected to obtain 0 to 6 inch surface sediment samples for chemical analyses.
 - Samples from all nine locations will be analyzed for TAL metals, including titanium and mercury, TOC and grain size.
 - At five pre-determined sample locations, five of the 0 to 6 inch samples will be submitted for organics analyses. See Figure 1 for the location of these five samples and Attachment 1, Worksheet 18.

Kearny Point Mudflat Samples:

- The first grab sample will be used to obtain the 0 to 1 inch surface sediment samples for radiochemistry dating only. All nine of these samples will be sent for radiological analyses.
- Co-located grab samples will be collected to obtain 0 to 6 inch surface sediments for the remaining analyses. Each of the 0 to 6 inch sediment samples will be submitted for TAL metals plus titanium and mercury, TOC and grain size. Five of these samples, distributed throughout the limits of the sampling grid, will also be analyzed for the organic parameters. See Worksheet 18 below and Figure 1 for the location of these five samples.

Where, when, and how should the data be collected/generated?

Surface sediment samples will be collected in the Passaic River between RM0 and RM1 (refer to Figure 1), in the spring of 2008 using an Ekman dredge per SOP No. 24 (See the December 2007 QAPP/FSP Addendum, Attachment 15).

Who will collect and generate the data?

Malcolm Pirnie field personnel will collect the samples. The samples will be analyzed by the same laboratories identified in the 2007 QAPP/FSP Addendum. These laboratories include:

- Accutest - TAL metals, including titanium and mercury and TOC
- Outreach Analytical - Be-7, K-40 and Cs-137
- GeoSea - Grain Size
- AXYS Analytical - PCB congeners, PCDDs/PCDFs, pesticides and PAHs

How will the data be reported?

The data will be reported by the assigned laboratory to Malcolm Pirnie Inc as described in the December 2007 QAPP Addendum for the Lower Passaic River Empirical Mass Balance Evaluation.

How will the data be archived?

Electronic data deliverables will be archived in the PREmis data base. Hardcopy files of field and laboratory data will be kept in the Malcolm Pirnie project files. The retrieval of the data by others will be at the discretion of the USACE-KC and the USEPA. The length of time for which the data will be archived will be at the discretion of the USACE-KC and the USEPA.

QAPP Worksheet #18

(UFP-QAPP Manual Section 3.1.1)

List all site locations that will be sampled and include sample/ID number, if available. (Provide a range of sampling locations or ID numbers if a site has a large number.) Specify matrix and, if applicable, depth at which samples will be taken. Only a short reference for the sampling location rationale is necessary for the table. The text of the QAPP should clearly identify the detailed rationale associated with each reference. Complete all required information, using additional worksheets if necessary.

☐ Worksheet Not Applicable (State Reason)

Sampling Locations and Methods/SOP Requirements Table

Sampling Location/ID Number (Note 1)	Matrix	Depth (inches)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference	Rationale for Sampling Location
Samples collected across transects of Navigation Channel at approximately RM0, RM0.2 and RM0.6	Surface Sediment	0-1	Radiochemistry (Be-7, Cs-137 and K-40), TOC, TAL metals including titanium and mercury and grain size	Low	9 samples (A portion of each of these will be frozen for possible organic analyses)	SOP 24, Ekman Dredge	To determine if sediments have deposited at this location over the past 6 months and to determine metals contamination.

Sampling Locations and Methods/SOP Requirements Table

Sampling Location/ID Number (Note 1)	Matrix	Depth (inches)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference	Rationale for Sampling Location
Samples collected across transects of Navigation Channel	Surface Sediment	0-1	PCDDs/PCDFs, PCB Congeners, Pesticides and PAHs	Low	2 samples; the locations will be selected based on Be-7 results	SOP 24, Ekman Dredge	To determine the levels of organic contamination in the surface sediment
Co-located samples across transects of the Navigation Channel	Surface Sediment	0-6	TAL metals including titanium, mercury, TOC, Grain Size	Low	9 samples	SOP 24, Ekman Dredge	To determine the levels of chemical contamination in the surface sediment.
Samples collected across transects of Navigation Channel (At #4, 5, 6, 7 and 8)	Surface Sediment	0-6	PCDDs/PCDFs, PCB Congeners, Pesticides and PAHs	Low	5 samples (a subset of the above 9 samples)	SOP 24, Ekman Dredge	To determine the levels of organic contamination in the surface sediment.
Samples collected from the Kearny Point Mudflats	Surface Sediment	0-1	Radiochemistry (Be-7, Cs-137 and K-40)	Low	9 samples plus one field duplicate (Note 2)	SOP 24, Ekman Dredge	To determine if sediments have deposited at this location over the past 6 months.

Sampling Locations and Methods/SOP Requirements Table

Sampling Location/ID Number (Note 1)	Matrix	Depth (inches)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference	Rationale for Sampling Location
Co-located samples collected from the Kearny Point Mudflats (Organics analysis will be on samples from #10, 12, 14, 15, and 18)	Surface Sediment	0-6	TAL metals including titanium, mercury, TOC, Grain Size plus a subset of the samples for PCDDs/PCDFs, PCB Congeners, Pesticides and PAHs	Low	9 samples plus one field duplicate for TAL, TOC, and grain size; 5 samples plus one field duplicate for organics (Note 2)	SOP 24, Ekman Dredge	To determine the levels of chemical contamination in the surface sediment.

1. See Figure 1 for the proposed sample collection locations, and Table 1, below, for Global Positioning System (GPS) coordinates which should be approximated $\pm 50'$.

2. The field duplicate should be analyzed for all parameters.

Table 1
Proposed Samples Locations

Sample Type	Easting	Northing	Map Location Number	Field ID (See note 2)	0 to 1 Inch Radio-chemistry	0 to 1 Inch Metals, TOC, Grain Size	0 to 1 inch Archived/Frozen for Organic Analyses (See Note 1)	0-6 Inch Metals, TOC, Grain Size	0-6 Inch Organic Analyses
Channel Transect	596684	686910	1	T1W	X	X	X	X	
Channel Transect	596927	686902	2	T1C	X	X	X	X	
Channel Transect	597154	686893	3	T1E	X	X	X	X	
Channel Transect	596738	684966	4	T2W	X	X	X	X	X
Channel Transect	596952	684964	5	T2C	X	X	X	X	X
Channel Transect	597137	684964	6	T2E	X	X	X	X	X
Channel Transect	597222	682880	7	T3W	X	X	X	X	X
Channel Transect	597458	682963	8	T3C	X	X	X	X	X
Channel Transect	597640	683026	9	T3E	X	X	X	X	
Mudflat	597583	686841	10	MF1	X			X	X
Mudflat	597761	686266	11	MF2	X			X	
Mudflat	597532	685593	12	MF3	X			X	X
Mudflat	598863	685595	13	MF4	X			X	
Mudflat	597853	684951	14	MF5	X			X	X
Mudflat	598502	684975	15	MF6	X			X	X
Mudflat	597533	684366	16	MF7	X			X	
Mudflat	598146	684367	17	MF8	X			X	
Mudflat	597831	683696	18	MF9	X			X	X

1. Two of the archived/frozen 0 to 1 inch sediment samples will be selected for organic analyses based upon Be-7 data.
2. Used by the field crew to identify sampling locations. T=Transect, MF= Mudflat, E = East, C= Center, W= West

QAPP Worksheet #19 (UFP-QAPP Manual Section 3.1.1) -- Analytical SOP Requirements Table
Analytical SOP Requirements Table

Matrix	Analytical Group	Conc. Level	Analytical and Preparation Method/SOP Reference³	Sample Volume/Mass per Analysis	Containers (number, size, and type) ^{1,2}	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/analysis)
Sediment	PCB Congeners	Low	USEPA Method 1668A	10 grams ³	4 oz. glass jar ⁴	Maintain in the dark at less than 4°C from time of collection until receipt at the lab or ship frozen on dry ice	If stored at less than -10°C solid multiphase samples can be stored for up to one year. Sample extracts can be stored at less than – 10°C for up to one year
Sediment	PCDDs /PCDFs	Low	USEPA Method 1613B				
Sediment	Pesticides	Low	Axys Method MLA-028 (HRGC/HRMS similar to 1613B)			Cool to 4 °C ± 2°C or ship frozen on dry ice frozen	14 days to extraction, 40 days to analysis. (For this study pesticide samples can be stored 299 days if frozen.)
Sediment	PAHs	Low	Axys Method MLA-021 (similar to SW846-8270)	10 grams	4 oz. glass jar	Cool to 4 °C ± 2°C or ship frozen on dry ice	14 days to extraction, 40 days to analysis. (For this study PAH samples can be stored 199 days if frozen.)

Analytical SOP Requirements Table

Matrix	Analytical Group	Conc. Level	Analytical and Preparation Method/SOP Reference³	Sample Volume/Mass per Analysis	Containers (number, size, and type) ^{1,2}	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/ analysis)
Sediment	TOC	Low	USEPA Method Lloyd Kahn	1 gram	4 oz. glass jar	Cool to 4 °C ± 2°C	28 days
Sediment	TAL Metals plus Titanium and Mercury	Low	SW-846-6010B and 6020/7470A (The lab will use ICP-AES and, if necessary, ICP-MS, to obtain the most sensitive detection limits)	2 grams (must provide the lab at least 10 grams)	4 oz. glass or plastic jar	Cool to 4 °C ± 2°C	6 months for TAL Metals, 28 days for Mercury (For this study samples for metals other than mercury can be stored up to 1 year if frozen.)
Sediment	Radiochemistry Be-7, Cs-137 and K-40	Low	HASL-300 EML or USEPA Method 4 80-032	If possible supply the lab at least 200 to 300 grams of wet sediment so >100 grams of dry sediment are available to be counted	16 oz. glass jar	NA	Be-7 should be counted as soon as possible or within one month, since it has a short half-life. For this study Cs-137 and K-40 samples can be held up to 6 months.

Analytical SOP Requirements Table

Matrix	Analytical Group	Conc. Level	Analytical and Preparation Method/SOP Reference³	Sample Volume/Mass per Analysis	Containers (number, size, and type) ^{1,2}	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/analysis)
Sediment	Grain size	Low	ASTM D4464 Laser Light Scattering or equivalent	5 g	4 oz glass jar	Airtight container (do not freeze)	6 months

1. The sample containers used for each chemical parameter must be certified as being clean or have been decontaminated by the laboratory.
2. The type and number of containers required may be adjusted to reflect the requirements of the individual laboratories selected to perform the analyses. The laboratories may allow combining analyses requested per jar to reduce the number of jars required.
3. Axys Analytical can perform the extraction of the PCB Congeners, PCDD/Fs and Pesticides on 10 grams of sediment sample.
4. A single 4 oz. sample can be collected for these three parameters.

QAPP Worksheet #20 (UFP-QAPP Manual Section 3.1.1) -- Field Quality Control Sample Summary Table

The following table(s) summarizes the number of field QC samples that will be collected and sent to the laboratory by matrix, analytical group, and concentration level.

Field Quality Control Sample Summary Table

Matrix	Analytical Group	Con c. Level	Analytical and Preparation SOP Reference	Minimum No. of Sampling Locations	No. of Field Duplicate Pairs	No. of MS ¹	No. of Trip Blanks	No. of Equip. Blanks	No. of PT Samples	Approx. No. of Samples to Lab
Sediment	PCB Congeners	Low	USEPA Method 1668A	12	1 per 20 samples	NA	NA	1 per event	NA	13
Sediment	PCDDs/PCDFs	Low	USEPA Method 1613B	12	1 per 20 samples	NA	NA	1 per event	NA	13
Sediment	Pesticides	Low	Axys Method MLA-028 (HRGC/HRMS similar to 1613B)	12	1 per 20 samples	NA	NA	1 per event	NA	13
Sediment	PAHs	Low	Axys Method MLA-021 (similar to 8270)	12	1 per 20 samples	NA	NA	1 per event	NA	13
Sediment	TAL Metals plus Titanium and Mercury	Low	SW-846-6010B and 6020 plus 7470A	27	1 per 20 samples	NA	NA	1 per event	NA	29

Field Quality Control Sample Summary Table

Matrix	Analytical Group	Con c. Level	Analytical and Preparation SOP Reference	Minimum No. of Sampling Locations	No. of Field Duplicate Pairs	No. of MS¹	No. of Trip Blanks	No. of Equip. Blanks	No. of PT Samples	Approx. No. of Samples to Lab
Sediment	Radio-Chemistry (Be-7, Cs-137, and K-40)	Low	Gamma Spec HASL 300 EML	18	1 per 20 samples	NA	NA	NA	NA	19
Sediment	Total Organic Carbon	Low	USEPA Lloyd Kahn Method	27	1 per 20 samples	NA	NA	NA	NA	29
Sediment	Grain Size	NA	ASTM 4464 or equivalent	27	1 per 20 samples	NA	NA	NA	NA	29

1. If MS/MSDs are required on solid samples, a separate sample jar is not required since they are performed using a portion of the sample.

QAPP Worksheet #21 (UFP-QAPP Manual Section 3.1.2) -- Study Sampling SOP References Table

The following is a list of all SOPs associated with study sampling including, but not limited to, sample collection, sample preservation, equipment cleaning and decontamination, equipment testing, inspection and maintenance, supply inspection and acceptance, and sample handling and custody. Include copies of the SOPs as attachments or reference all in the QAPP. Sequentially number sampling SOP references in the Reference Number column. The reference number can be used throughout the QAPP to refer to a specific SOP.

Study Sampling SOP References Table

Reference Number	Title, Revision Date and/or Number	Originating Organization	Equipment Type	Modified for Study Work?	Comments
SOP 1	Procedure to Conduct Sample Management for CLP and Non-CLP Samples, August 2006, Revision No. 0	Malcolm Pirnie, Inc.	Note book, personal computer, safety glasses, gloves, sample coolers, ice, sample labels, etc.	No	Attachment 3 to December 2007 QAPP/FSP Addendum
SOP 2	Procedure to Conduct Sample Preservation	Malcolm Pirnie, Inc.	Ice and reagents	No	Attachment 5 to December 2007 QAPP/FSP Addendum
SOP 4	Procedure to Locate Sample Points Using a Global Positioning System (GPS)	Malcolm Pirnie, Inc.	GPS device	No	Attachment 9 to December 2007 QAPP/FSP Addendum
SOP 7	Decontamination of Water Sampling Equipment	Malcolm Pirnie, Inc.	Refer to Attachment	No	Attachment 10 to December 2007 QAPP/FSP Addendum
SOP 8	Procedure for Sediment Probing	Malcolm Pirnie, Inc.	Boat, metal probing device	No	Attachment 11 to December 2007 QAPP/FSP Addendum
SOP 21	Procedure for use of Horiba for Measuring Water Parameters	Malcolm Pirnie, Inc.	Horiba Instrument	No	Attachment 13 to December 2007 QAPP/FSP Addendum

Study Sampling SOP References Table

Reference Number	Title, Revision Date and/or Number	Originating Organization	Equipment Type	Modified for Study Work?	Comments
SOP 22	Management and Disposal of Investigation Derived Waste	Malcolm Pirnie, Inc.	Refer to Attachment	No	Attachment 14 to December 2007 QAPP/FSP Addendum
SOP 24	Collecting Surface Sediments Using an Ekman or Ponar Dredge	Malcolm Pirnie, Inc.	Ekman or Ponar Dredge, dredge liner, etc.	No	Attachment 15 to December 2007 QAPP/FSP Addendum